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How have Patients' Experiences of Cancer Care Been Linked to Survival? A Systematic Review

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Research

How have patients' experiences of cancer care been linked to survival? A systematic review

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Abstract
Patient experience of care remains an important indicator of health care quality. Although studies show care experiences are associated with health outcomes for some conditions, the situation for cancer is unclear. New datasets on cancer patients in the US, Canada, and UK linking information on experiences and survival may enable an exploration of any association. This review aimed to identify studies linking any aspect of cancer patients' experiences to their survival, to inform future analyses. We performed a systematic review using Medline database from January 1998 until March 2018. The settings included outpatient oncology clinics, primary care, hospitals, and cancer centres. The participants included adult patients from different demographic groups. 16 Studies (ten observational, two clinical trials, two qualitative, and two consecutive case series) describing a wide range of settings, populations and methods met our inclusion criteria. Patients' experiences were mostly linked to survival in quantitative studies. Satisfaction with care and psychosocial support were the aspects of experience associated with survival. Although positive associations between experience and survival were more common, negative and lack of association findings were also reported. Overall, there was no agreement on the strength, direction of the association, and the type of measurements to use. In conclusion, a wide range of studies suggest a relationship may exist between patients' experiences of cancer care and their survival. However, this relationship is complex and methodological challenging to study. Future research should carefully consider different aspects of patient experience and care and the way in which they may affect cancer survival.

Keywords
Cancer, patient experience, survival, quality of care

Introduction

Patient-centred care is now recognised as an essential component of high quality healthcare.[1] Patient experience is an important measure and interpretation of how patient-centred care principles and practice are perceived by patients receiving health care.[2] A considerable international literature on patient experience has grown in response to the increasing emphasis on and measurement of patients' experiences in healthcare systems.[3–5] Wolf and colleagues point out that "patient experience reflects occurrences and events that happen independently and collectively across the continuum of care".[6] The link between patient experience and health outcomes has been investigated in many different healthcare settings.[7] Several studies across a range of health conditions and different populations have documented associations between patient experience and care effectiveness,[8,9] patient safety,[10] and mortality.[11]

Cancer outcomes are influenced by cancer type, stage of disease, comorbid conditions at diagnosis, and the quality of cancer care the patient receives.[12] The possibility of an association between patient experience and survival has not often been investigated in a cancer care setting. Sociodemographic and systemic variations in patient experience with cancer care have been documented in several studies from the United States[13,14] and England.[15–19] Some of the factors associated with poorer experience such as lower socioeconomic status are also associated with poorer outcomes raising the question of whether an independent association exists between patients' experiences of cancer care and their survival.

Several systematic reviews have focused on cancer patient experience. Sanders and others[20] conducted a review to investigate the available instruments used to measure the cancer patient experience of health care. They found that there is a lack of studies measuring cancer patient experience in a systematic and consistent way.[20] Mollica and colleagues performed a scoping review of cancer patient experience, considering only the core domains of Services Consumer Assessment of Healthcare Providers and Systems (CAHPS) – a patient experience instrument used widely in the USA, that summarized the literature and identified possible future directions for research.[21] Their review identified a gap in the research literature regarding

the relationship between cancer care experience and survival. Thus, the aim of this study was to search the medical literature systematically to determine how patients' experiences of cancer care have been linked to survival. We hoped that this would inform 1) directions for future research in this area and 2) the development of analyses of the recently available linked patient experience and patient survival databases.[22,23]

Method and approach

Patient experience is a term that refers to different dimensions of the interaction between patients and the healthcare system and has not yet been recognized as a subject heading in health science databases. Previous systematic reviews on patient experience have also used different dimensions to extract different types of literature.[10,21] We chose to use the patient experience dimensions presented by Doyle and colleagues since they combined patient experience dimensions from the Institute of Medicine, Picker Institute, and National Institute for Health and Care Excellence (NICE).[10]

We identified possible words and terms that might denote literature on dimensions of patient experience (Table 1 and Box 1). We used cancer survival as the outcome, and a range of different terms to extract possible relevant literature (Table 1). We limited this first review to Medline due to the complexity of duplicating the same terms in other databases and assumed that most of quantitative articles investigating survival would be indexed in Medline. After combining these terms together, and using the Medline database, we identified 1830 papers that were published between January 1998 and March 2018. Titles and abstracts for all 1830 articles were first read by one reviewer (AS) who excluded 1683 as not at all relevant. The remaining 147 were read and a shortlist of 26 full text articles prepared (Figure 1).

In addition, since patient experience is an emerging research field, we considered eligible papers that have been referred to in the following popularly cited articles that linked patients' experiences to their health outcomes,[8,9] in the scoping review about cancer experience with care,[21] and in a popular systematic review that linked patients' experience to clinical safety and effectiveness across many health conditions including several types of cancer.[10] Following that, we used Google Scholar features, "Cited by" and "Related Articles", to review the citation histories of these popular articles to consider any additional paper that has linked patients' experiences to cancer survival (Figure 1). By doing so, we found an additional nine articles that met our inclusion criteria.

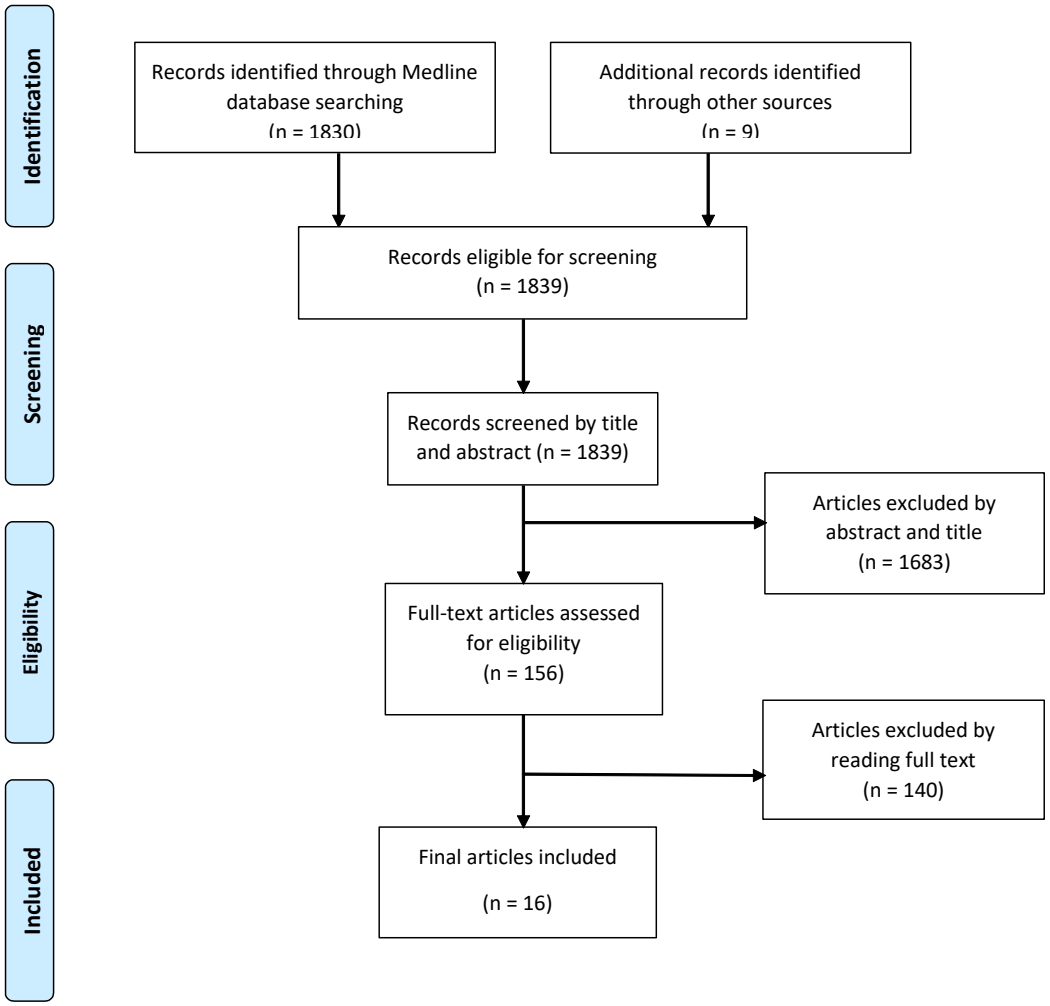
Table 1. Patient experience terms used in combination with cancer(neoplasm) and cancer survival terms

Cancer patient experience aspects terms	Cancer term	Survival terms
Patient centered care	Neoplasm	Treatment outcome
Physician-patient relations		Survival
Patient preference		Disease-Free Survival
Patient participation		Survival Analysis
Patient satisfaction		Survival Rate
Quality of health care		Mortality
Patient experience		Prognosis
Surveys and questionnaires		
Decision making		
Health care surveys		
Continuity of patient care		
Communication		
Social support		
Empathy		

Box 1. Full electronic search strategy for patient experience terms used in Medline database

Patient-Centered Care/ OR Physician-Patient Relations/ Patient Preference/ or Patient Participation/ Patient Satisfaction/ Or "Quality of Health Care"/ or "patient* experience*".mp./ OR "Surveys and Questionnaires"/ Decision Making/ or Health Care Surveys/ OR "Continuity of Patient Care"/ Communication/ Patient Preference/ Social Support/ Empathy/ AND Neoplasms/ AND treatment outcome/ OR Survival/ or Disease-Free Survival/ or Survival Analysis/ or Survival Rate/ OR Mortality/ OR Prognosis/

Figure 1. Systematic review flowchart using PRISMA[24]



The preliminary shortlist of eligible research papers were initially chosen by the first reviewer (SA), and these were read independently by another reviewer (ED) and discussed with a third (ML). The first reviewer then extracted the following information (type of study, sample size, country, setting, study aim, cancer type, unit of analysis, patient experience aspect and method used, primary outcomes and method used, and results) from each study and these aspects were independently assessed by reviewers (ED, ML) to determine the final eligible articles. In addition, although many assessment tools were available, we chose the Effective Public Health Practice Project Assessment Tool[25] to assess the quality of the included quantitative studies due to the variety in design of included studies (Appendix 1).

We included studies that linked any aspect of patient experience with cancer survival. This included studies where the experience was reported by patients, doctors, GPs, or extracted from healthcare systems records. Patient Reported Outcomes Measures (PROM) studies were excluded on the basis that they do not ask questions about patient experiences, but rather about symptoms and outcomes. All types of studies such as cross sectional, cohort and case control studies that used validated tools or specifically developed interviews to measure or assess patient experience dimensions and linked that to a measure of cancer survival were included. The studies were categorized into four groups, based on their main aims and how they linked patients' experiences to cancer survival: (1) preferences for information about cure or treatment, (2) psychosocial support (3) a care system or team intervention, and (4) patient satisfaction.

Results

A total of 16 journal articles met the inclusion criteria including 11 observational studies,[26,27,36,28–35] one quantitative content analysis,[37] two clinical trials,[38,39] and

two consecutive case series.[40,41] The included studies varied widely in methods, population and findings. Table 2 (found at the end of the article) summarizes the study aims, study population, methods, patients experience aspects, and study outcomes.

Preferences for information about cure or treatment

Two studies - one cohort[34] and one cross sectional[33] - focused on patients' expectations for cancer cure, their treatment preference, relations with oncologists and how they perceived quality of care to be. Gleason et al examined whether lung, colorectal, breast, lymphoma, head and neck, liver, and leukaemia cancer patients' expectations for cure influence their decisions to follow treatment recommendations and whether these are affected by oncologist–patient alliance.[33] The authors found that patients who expected a cure were more likely to report an intention to follow oncologists' treatment recommendations.[33] Additionally, Rose and colleagues focused on the difference between older and middle-aged late-stage cancer patients in terms of care preference, relations with oncologist, perceived quality of life and estimation of survival.[34] This study concluded that both middle-aged and older patients and their physicians had different perspectives regarding perceived quality of life, physician estimation for patents' survival, and patient's estimation for their survival.[34] In addition, the majority of patients in both groups had treatment goals of relieving pain or discomfort.[34]

Psychosocial support

Four studies (one clinical trial,[39] two observational studies,[35,36] and one qualitative study[37]) focused on psychosocial support and patients' survival. Burns et al investigated whether emotional support was predictive of survival among patients with incurable breast, lung, and gastrointestinal, prostate, and haematological cancer. They found that survival (follow-up 36 months) was significantly shorter among those with two to three confidants than among those with more or fewer confidants ($p=0.031$). They also found emotional support to be an independent prognostic indicator of survival.[35] Guo et al determined the benefits of psychosocial interventions for breast, lung, cervical, endometrial cancer patients who were undergoing radiotherapy[39]. Although no significant difference between cases and controls in terms of survival was found, the psychological intervention significantly reduced symptoms of anxiety ($p < 0.05$) and depression ($p < 0.05$), as well as improved elements of quality of life such as global health status ($p < 0.05$) in the intervention group.[39] In addition, in a qualitative analysis, Buis and colleagues analysed 3717 posts on the internet, made by patients with lung, pancreatic, melanoma, and thyroid cancer, to determine how emotional and informational support contents differ in online communities for cancers with high and low five-year survival.[37] Within the posts containing social support content, high-survival cancer communities had more content including emotional support (75%) than low-survival communities (66%). By contrast, low-survival communities had more informational content (46%) than high survival communities (36%).[37] Finally, Cunningham and colleagues focused on the variation in psychological responses to the diagnosis of life-threatening cancer and whether that is related to survival in several types of cancers.[36] Even though this study had a limited sample size ($n=22$), patients who had a lower psychological score had a statistically significant median survival of 1.29 years while those with higher psychological score had median survival of 2.85 years. The authors attributed this to psychological self-help activities such as relaxation, meditation, and spiritual activities.[36]

Health care system and team intervention

Two studies (one cross sectional study[32] and one non-randomised clinical trial[38]) focused on the cancer care system, or team interventions and their association with cancer survival. McCarthy and colleagues investigated various aspects of the performance of breast, colorectal, lung and prostate cancer services and whether they were related to survival at the hospital level or specialist services level.[32] They combined five different datasets including waiting time, compliance with standards, cancer patient experience survey, hospital routinely collected data, and cancer survival data.[32] Their analysis showed that higher breast cancer one-year survival ($p=0.04$) and lung cancer five-year survival ($p=0.014$) at cancer network level was associated with higher overall dissatisfaction scores.[32] In addition, Daly and colleagues conducted a non-randomized clinical trial to evaluate the effects of interdisciplinary cancer support team on quality of life and quality of care among patients with advanced colorectal, lung, and gynaecologic cancers.[38] The study found no significant difference between cases and controls in quality of care; but that the five-year survival probability was the most significant effect on quality of care outcomes ($p = 0.04$).[38]

Patient satisfaction

Eight studies, (five cross sectional studies,[26–28,30,31] two consecutive case series,[40,41] and one prospective cohort study[29]), were conducted at Cancer Treatment Centres of America hospitals, and focused on the association between patient satisfaction and survival. This research assessed different types of patient satisfaction including patient satisfaction with service quality and patient satisfaction with quality of life. After controlling for variables such as cancer stage at diagnosis, previous treatment history, and treatment location, patients who had higher satisfaction

with their service quality had a lower risk of mortality than those with low satisfaction score in the following cancers: colorectal (hazard ratio (HR) = 0.74; 95% CI: 0.58–0.95; p = 0.02),[27] pancreatic (HR= 0.63; 95% CI: 0.51–0.79; p = 0.001),[31] breast (HR= 0.71; 95 % CI 0.57–0.87; p=0.001),[28] and non-small cell lung (HR = 0.71; 95% CI: 0.60–0.85; p < 0.001).[29] Later, Gupta and colleagues added self-rated health as an independent variable and examined the same association in non-small cell lung[30] and prostate cancers independently.[26] They found that self-rated-health was significant in predicting survival in non-small cell lung cancer (HR = 0.75; 95% CI: 0.57 to 0.99; p=0.04) and prostate[26] cancer (HR= 0.25; 95 % CI: 0.11-0.58; p=0.001). Thus, self-rated-health confounded the relationship between patient satisfaction and survival in non-small cell lung cancer[30] and replaced patient satisfaction in prostate cancer[26] as a predictor of survival. In two other studies conducted at the same cancer centre, Lis and colleagues assessed whether patient satisfaction with quality of life can predict survival in advanced colorectal[41] and pancreatic cancers.[40] After controlling for cancer stage at diagnosis (in both) and previous treatment history (only in colorectal), baseline patient satisfaction with quality of life was prognostic for survival in advanced colorectal cancer (p=0.0003),[41] but not in pancreatic cancer (p=0.053).[40] Overall, findings from these studies support the importance of assessing the relationship between patient satisfaction, self-rated health, and quality of life measures in cancer patent experience. Yet, the inconsistency in the results is puzzling. It might be a result of differing effects of type of cancer, pathways of possible influence for patient experience, care offered at different treatment centres, and different measuring instruments used in the studies. All of these possibilities emphasize the need for a systematic and consistent way to assess the association between cancer patient experience and subsequent survival.

Discussion

The aim of this study was to systematically review the literature to determine how cancer patient experience has been linked to cancer survival. We hoped to inform the direction of research in this area and analysis of the recently available linked patient experience and patient survival databases. Overall, this review revealed a variety of different methods and perspectives on how cancer patients' experiences were linked to survival across different types of cancer. Patients' satisfaction, psychosocial support, satisfaction with quality of life were the most common aspects of patient experience found to be associated with survival in the literature. The studies we included in our review showed positive, negative or lack of association cancer patient experience and subsequent survival. Thus, these studies suggest a relation exists between patients' experiences of cancer care and survival, but it is a complex and methodological challenging one to study.

Previous systematic reviews have identified several gaps in the cancer patient experience research field. Sanders et al found that there is a lack of studies measuring cancer patient experience in systematic and consistent ways.[20] We found a wide range of methods, settings, and population used to measure cancer patients experience and to link it to subsequent survival. Moreover, Mollica et al conducted a review to summarize the cancer patient experience literature, indicate research gaps, and provide future research directions.[21] They identified a gap in research examining relationships between cancer experience and survival. Our study contributes to closing this gap by finding that cancer patients' experiences have been linked to survival in a number of studies and revealing a complex and challenging relationship to unpick. In addition, Doyle et al demonstrated a positive association between patient experience and patient safety and clinical effectiveness across a wide range of disease areas including several types of cancer.[10] Several studies included in our review suggested a positive association between cancer patient experience and patient survival. However, as our review shows a clear heterogeneity across all aspects of linking cancer patient experience with subsequent survival, not all of these studies gave a clear overall indication of the magnitude of any observed association.

Our findings show the difficulty of determining the association between patient experience and survival. While the finding is a novel one for cancer care settings, several studies in other health settings have raised concerns that any possible association between patient experience and health outcomes may be biased by patient characteristics, or affected by reverse causation or confounded by factors within the healthcare system or related to the patient's health situation.[7,42,43] These issues were found in several studies included in this review. For example, the conclusion that cancer survival can be predicted by measuring patient self-rated health or patient satisfaction with services quality or with quality of life was contradicted by findings within studies conducted by the same research group.[26–31,40,41] Despite the different cancer types in these studies, such a contradiction in the final conclusions demonstrates the importance of using appropriate methodological tools when assessing association between patient experience and health outcomes in cancer setting as the case in other health settings.

The present study has several strengths. First, it is, to our knowledge, the first study that examines how cancer patient experience has been linked to cancer survival. Second, using the methods presented by Doyle et al ,[10] we extended the patient experience dimensions to include those presented by the Picker Institute, NICE to catch all dispersed terms. In addition, since the association between patient experience and health outcome is an emerging field and not well established in the literature, we included

relevant articles from similar systematic reviews and popular studies in the field to make sure we included all relevant studies in the field.

However, our study is subject to several limitations. This systematic review was limited to English language articles in Medline database and did not include other medical databases such as CINAHL, which might include some eligible studies. This exclusion was due to the complexity and lack of uniformity of the MeSH terms for patient experience dimensions in different medical databases. This is an area for future research to review the current used MeSH terms for measuring patient experience given the importance of measuring these elements in current research. Second, some of the included studies in our review had several methodological limitations within them including sample size, absence of a control group and not considering reverse causation. For example, several of the patient satisfaction studies we included reported contradictory results across several types of cancer and needed an appropriate reverse causation analysis using systematic and consistent instruments. However, we decided to include them since the main aim of this study is to examine how patients experience have been linked to survival in the literature, not to draw a conclusion on the strength and direction of association between cancer patient experience and cancer survival. Finally, we cannot exclude the possibility of publication bias for significant positive or negative association findings.

Conclusion

The possible association between patient experience with cancer care and subsequent outcomes continues to emerge as an important topic. The availability of the UK[22], Canada[44], and US[23] datasets that contain information on both cancer patients' experiences and their survival status will enable researchers to explore such an association. This review highlights the methodological complexity of determining a possible relationship between cancer patient experience and subsequent survival. While future research is recommended to examine the strength and direction of this association, appropriate conceptual and methodological consideration is warranted before studying or drawing a conclusion on this association.

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Table 2. Summary of the included studies

Citation	Type of study, sample size, country	Setting	Study aim	Cancer type	Unit of analysis	Patient experience aspect and method used	Primary Outcomes and method used	Result on association and notes
Buis, et al (2011). Comparison of social support content within online communities for high-and low-survival-rate cancers. CIN: Computers, Informatics, Nursing, 29(8), 461-467	3717 posts made by patients in online cancer support forums, USA.	Internet (Yahoo and the Association of Cancer Online Resources).	How emotional and informational support content differs in online communities for cancers with high and low 5-year relative survival rates.	Lung, pancreatic, melanoma, and thyroid	Individual internet posts	Quantitative content analysis of emotional and informational support needs expressed were recorded by two independent coders.	Analysis of whether the cancer communities with high or low 5-year survival rate made more posts about needs for emotional or informational support using descriptive statistics and chi-square test.	The relationship between more emotional support comments and 5-year survival rate was significant. Within the posts containing social support content, high-survival rate communities contained more emotional support (75%) content than low-survival communities (66%). In addition, low-survival rate communities had more informational content (46%) than high survival rate communities (36%) rate communities (36%).
Rose, J. H., et al (2004). Perspectives, preferences, care practices, and outcomes among older and middle-aged patients with late-stage cancer. Journal of clinical oncology, 22(24), 4907-4917	Prospective cohort study, 1416 patients, USA.	Five teaching hospitals in USA	To evaluate relationships among physician and cancer patient survival estimates, patients' perceived quality of life, care preferences, and outcomes, and how they vary across middle-aged and older patient groups.	Late- stage cancer, types not mentioned.	Patient	Perspectives were measured by assessing: patient's survival estimate, physician's survival estimate and patient's perceived quality of life. Care practice was measured by assessing discussion about aggressive care and therapeutic intervention. Patient's preference was measured by assessing their preference for cardiopulmonary resuscitation.	Outcome was measured by readmission to hospital and death in 6-month timeframe.	Patients' preferences for treatment to extend their lives, did not translate to longer survival in both older and middle-aged patients. In contrast, physicians were less optimistic about patients' survival in both age groups. In addition, majority of patients in both groups preferred treatment goal of reducing pain and discomfort.

Table 2. Summary of the included studies (cont'd.)

Gleason, et al (2009). The influence of patient expectations regarding cure on treatment decisions. Patient education and counseling, 75(2), 263-269	Cross sectional, study of 101 patients, USA.	Outpatient oncology clinics at two National Cancer Institute designed comprehensive cancer centers.	To examine whether cancer patients' expectations for cure prior to interacting with their oncologist influence their decisions to follow treatment recommendations and to examine if patients' expectations for cure are affected by the strength of the oncologist–patient alliance or the extent to which companions (if present) share patients' expectations for cure.	Lung, colorectal, breast, lymphoma, head / neck, liver, leukemia and other.	Patient and companion	(1) To assess expectations for cure, patients and companions were asked four questions independently: if they expected the cancer to be cured, or will not worsen but not cured, or symptoms will be relieved but cancer will not be cured, or if they do not know what to expect. (2) Oncologist patient alliance assessed by KAAS scale, which measures rapport, trust, closeness with oncologist, level of information, clarity, responsiveness, amount of hope provided by oncologist, and how organized is the oncologist.	Patient decision to follow oncologist's treatment recommendation assessed by self-report at phone interview and categorized as no intention, some intention, and intention to follow treatment recommendations.	Patients who expected a cure were more likely to report an intention to follow oncologist's treatment recommendation when their alliance with the oncologist was not strong and when their companions do not believe they will be cured. In addition, this study concludes that a complex interaction of patient and companion, or oncologist and patient alliance and expectations influence patients' decisions.
Burns, C. M., et al(2005). Does emotional support influence survival? Findings from a longitudinal study of patients with advanced cancer. Supportive care in cancer, 13(5), 295-302.	Cross sectional study, 163 patients, Australia	Teaching hospital in Canberra, Australia	To investigate whether emotional support was predictive of survival duration among patients diagnosed with incurable cancers.	Breast, lung, gastrointestinal, prostate, hematological, ovary and other.	Patients aged 18 years or more and diagnosed with incurable cancers.	Emotional support was assessed by a specific survey consisting of three items: sharing feelings with others, if yes, with whom, is there anyone else to share feeling with.	Cancer survival was assessed at 6, 12, 18, 24, 30, 30, 36 months from study entry.	Number of confidents (0-1, 2-3, 4+) at entry time was predictive of survival duration after adjusting for primary cancer site and other variables. Specifically, Using two or three confidants as the reference group, the relative risk of a shorter survival was: 0.44 for patients with 0-1 confidants and 0.60 for those with four or more confidants. Emotional support appeared to be an independent prognostic indicator of survival after accounting for sex, age, cancer type, and treatment modality.

Table 2. Summary of the included studies (cont'd.)

Cunningham, et al (2000). A prospective, longitudinal study of the relationship of psychological work to duration of survival in patients with metastatic cancer. Psycho-Oncology, 9(4), 323-339.	Prospective study, 22 patients, Canada	Psychotherapy sessions took place at different times and different locations led by two of the authors.	To describe, in a more reliable and rigorous way, the individual variation in psychological responses to the predicament of life-threatening cancer, and to relate this variability to survival duration, using a case-oriented, correlative approach.	Breast, pancreatic, cervical, colorectal, ovarian, multiple melanoma.	Patient with incurable cancers	Variation in patient's response to the psychotherapy sessions assessed by three main methods: notes taken by investigators, written homework, and individual interview conducted by two investigators for two and half hour weekly for 1 year. The session consisted of three components: support, homework, and group psychotherapy.	Survival rate after following up for about five years.	Although the sample size is limited for this study (n=22) the study concluded that after controlling for the severity of disease there a strong association between longer survival and psychological factors. Those who had lower psychological score had a median survival of 1.29 years while those with higher psychological score had median survival of 2.85 years. The physiological factors related to the involvement of cancer patients in psychological self-help activities such as relaxation, meditation, and spiritual activities at home.

Table 2. Summary of the included studies (cont'd.)

Daly, et al (2013). Clinical trial of a supportive care team for patients with advanced cancer. Journal of pain and symptom management, 46(6), 775-784.	Non-randomized Clinical trial, 511 patients, USA.	Case Western Reserve University and University Hospitals Case Medical Center, Seidman Cancer Center, Cleveland, OH, USA.	To evaluate the effect of an interdisciplinary cancer support team (CST) on quality of care and quality of life in patients with advanced cancers.	Colorectal, lung, and gynecologic cancers.	Patients aged 18 years and over and diagnosed with cancer at stage 3 or 4.	To measure the effect of the interdisciplinary cancer support team (CST) intervention, which consists of advanced practice nurse, social workers, spiritual care counselor. A quasi-experimental design was used to measure the quality of care and quality of life outcomes.	Quality of end of life care using the National Quality Forum (NQF) standards. Survival expectation was in the regression analysis as part of the end of life measures.	There was no significance difference in survival between patients receiving interdisciplinary cancer support team (CST) and usual care on the quality of care indicators. In addition, patients with higher survival expectancy in the intervention arm had the greatest improvement in health-related quality of life scores compared to other groups.
Guo, Z., et al (2013). The benefits of psychosocial interventions for cancer patients undergoing radiotherapy. Health and Quality of Life outcomes, 11(1), 121.	Randomized clinical trial, 178 patients, China.	Hospital of Guilin medical university, China.	To determine the benefits of psychosocial interventions for cancer patients who received radiation therapy.	Breast, lung, cervical, endometrial, and other.	Patients aged 18 or older, diagnosed with cancer and who would go under radiation therapy.	Psychological intervention delivered by a clinician, a nurse and a radiation therapist and consisted of Psycho-education, cognitive-behavioral therapy, and supportive–expressive therapy.	Depression assessed by Zung self-rating depression scale, anxiety assessed by self-rating anxiety scale, quality of life assessed with (EORTC QLQ-C30), and survival analysis.	The psychological intervention significantly reduced the level of depression and anxiety, improved the elements of quality of life such emotional and physical functioning. However, there was no significant difference in the survival between the two groups.
McCarthy, et al. (2007). Is the performance of cancer services influenced more by hospital factors or by specialization?. Journal of public health, 30(1), 69-74	Cross sectional study, England, five independent national data sets.	Data collected from 152 hospitals and survival data came from National Cancer Registry.: 5891 patients with colorectal 4011 with lung, 25 772 breast, and 10 992 with prostate cancer completing the English cancer experience survey were included.	To examine whether cancer service performance across a range of quality indicators including patient satisfaction was related more to the hospital level, or specialist services level within the hospital across different tumor types.	Breast, colorectal, lung and prostate	Patients who responded to the survey and their survival estimates.	Satisfaction with care from National Cancer Patient Survey dataset and in hospital mortality and population-level survival from National Cancer Registry.	The different data sets were compared at both cancer network and hospital levels. In addition, 1-5-year relative survival was calculated for patients diagnosed in England between 1996 and 2001 (followed up to the end of 31 December 2002).	Variation was statistically significant across hospitals and networks in all measures. Breast cancer 1-year survival ($p=0.04$) and lung cancer 5-year survival ($p=0.014$) were associated with Higher dissatisfaction scores.

Table 2. Summary of the included studies (cont'd.)

Lis, et al (2015). The Relationship between Patient Satisfaction with Service Quality and Survival in Non-Small Cell Lung Cancer–Is Self-Rated Health a Potential Confounder?. *PloS one*, *10*(7), e0134617.	Cross sectional study, 778 patients, USA	Four Cancer Treatment Centers of America hospitals (CTCA hospitals were CTCA Eastern, CTCA Midwestern, CTCA Southwestern and CTCA Western).	To examine whether better self-rated health (SRH) confounds the relationship between patients' satisfaction and their survival in non-small cell lung cancer.	Non-small cell lung cancer.	All, non-small cell lung cancer adult patients who were seen at Cancer Treatment Centers American hospitals between July 2011 and March 2013, were eligible for this study.	Patients' satisfaction assessed by a paper-based questionnaire developed by the authors in 2006.	Patient survival between the dates a patient completed the survey and the date of patient's death from any cause or the date of last contact or last known to be alive.	Patients who were satisfied with their care had lower risk of mortality (hazard ratio = 0.75; 95% CI: 0.57 to 0.99; p=0.04) compared to those who were not satisfied. Also, patients who had better self-rated health had a significantly lower risk of mortality (HR = 0.61; 95% CI: 0.46 to 0.81; p =0.001). On multivariate analysis, only self-rated health was significant (hazard ratio = 0.67; 95% CI: 0.50 to 0.89; p = 0.007). Thus, it confounded the association between patients' satisfaction and survival.

Table 2. Summary of the included studies (cont'd.)

Gupta, et al (2012). The relationship between patient satisfaction with service quality and survival in pancreatic cancer. *Patient preference and adherence*, *6*, 765	Cross sectional study, 496 patients, USA	Cancer Treatment Centers of America® (CTCA) hospitals, USA.	To evaluate the relationship between patient satisfaction with cancer care service quality and survival in pancreatic cancer patients.	Pancreatic cancer	Adult pancreatic cancer patients who were seen at one of three Cancer Treatment Centers of America® (CTCA) hospitals (CTCA Eastern, CTCA Midwestern, and CTCA Southwestern) between July 2007 and December 2010.	Patients' satisfaction assessed by a paper-based questionnaire developed by the authors in 2006.	Patient survival between the date a patient completed the survey and the date of patient's death from any cause or the date of last contact or last known to be alive.	Patients who had higher satisfaction with care services had lower mortality (hazard ratio = 0.63; 95% confidence interval: 0.51–0.79; P = 0.001) than those who had lower satisfaction score after controlling for stage, treatment history, and treatment center.
Gupta, et al (2014). Patient satisfaction with service quality as a predictor of survival outcomes in breast cancer. Supportive Care in Cancer, 22(1), 129-134	Cross sectional study, 1521 patients, USA.	Cancer Treatment Centers of America (CTCA) hospitals, USA.	To evaluate the relationship between patient-reported satisfaction with service quality and their survival of breast cancer.	Breast cancer	Adult breast cancer patients who were seen at one of three Cancer Treatment Centers of America (CTCA) hospitals (CTCA hospitals were CTCA Eastern, CTCA Midwestern, and CTCA Southwestern between July 2007 and December 2010.	Patients satisfaction assessed by a paper-based questionnaire developed by the authors in 2006.	Patient survival between the dates a patient completed the survey and the date of patient's death from any cause or the date of last contact or last known to be alive.	Patients who had higher satisfaction with care services had lower mortality (hazard ratio = 0.71; 95 % CI 0.57–0.87; p =0.001) than those who had lower satisfaction score after controlling for stage, treatment history, and treatment center.

Table 2. Summary of the included studies (cont'd.)

Lis, et al (2006). Can patient satisfaction with quality of life predict survival in advanced colorectal cancer?. Supportive care in cancer, 14(11), 1104-1110	A consecutive case series, 177 patients, USA.	Cancer Treatment Centers of America (CTCA) hospitals, USA.	To evaluate the association between patient satisfaction with quality of life and survival in colorectal cancer patients undergoing care in a community hospital comprehensive cancer center.	Colorectal cancer	Adult colorectal cancer patients treated at Cancer Treatment Centers of America at Midwestern Regional Medical Center between April 2001 and November 2004.	Quality of life assessed by QLI scale, which covers health and physical, social and economic, psychological and spiritual, and family. Each one of these areas has questions about satisfactions.	Patient survival between the dates a patient first visits the hospital and the date of patient's death from any cause or the date of last contact or last known to be alive. The survival data obtained from the hospital cancer registry.	Patient's satisfaction with quality of life provided a prognostic information in colorectal cancer care. Specifically, health and physical subscale was significantly associated with survival (p=0.0003), with median survival being 20.6 months for high scores and 8.3 for low score after taking in account the stage of the disease at diagnosis and the treatment history.
Lis, et al . (2006). Patient satisfaction with quality of life as a predictor of survival in pancreatic cancer. International journal of gastrointestinal cancer, 37(1), 35-43	A consecutive case series, 55 patients, USA.	cancer Treatment Centers of America (CTCA) hospitals, USA.	To evaluate the association between patient satisfaction with quality of life and survival in pancreatic cancer patients undergoing care in a community hospital comprehensive cancer center.	Pancreatic cancer	Adult pancreatic cancer patients treated at Cancer Treatment Centers of America at Midwestern Regional Medical Center between April 2001 and November 2004.	Quality of life assessed by QLI scale, which covers health and physical, social and economic, psychological and spiritual, and family. Each one of these areas has questions about satisfactions.	Patient survival between the dates a patient first visits the hospital and the date of patient's death from any cause or the date of last contact or last known to be alive. The survival data obtained from the hospital cancer registry.	No Quality of life subscale was found to be statistically significant after controlling for stage at diagnosis.

Table 2. Summary of the included studies (cont'd.)

Gupta, et al (2013). Can patient experience with service quality predict survival in colorectal cancer?. *Journal for Healthcare Quality*, *35*(6), 37-43	Cross sectional, 702 patients, USA	Cancer Treatment Centers of America (CTCA) hospitals, USA.	To evaluate the relationship between patient-reported experience with service quality and survival colorectal cancer patients.	Colorectal cancer	Adult colorectal cancer patients who were seen at one of three Cancer Treatment Centers of America (CTCA) hospitals (CTCA hospitals were CTCA Eastern, CTCA Midwestern, and CTCA Southwestern) between July 2007 and December 2010.	Patients satisfaction assessed by a paper-based questionnaire developed by the authors in 2006.	Patient survival between the dates a patient completed the survey and the date of patient's death from any cause or the date of last contact or last known to be alive.	Patients who had higher satisfaction with their service quality had lower mortality (hazard ratio = 0.74; 95% CI: 0.58–0.95; p = 0.02) than those who had lower satisfaction scores after controlling for stage, treatment history, gender, age, and treatment center.
Gupta, et al (2015). Self-rated health supersedes patient satisfaction with service quality as a predictor of survival in prostate cancer. Health and quality of life outcomes, 13(1), 137	Cross sectional study, 917 patients, USA.	Cancer Treatment Centers of America®(CTCA) hospitals, USA.	To investigate whether self-rated health can supersede patients' satisfaction as a predictor of survival in prostate cancer patients.	Prostate cancer	Adult prostate cancer patients who were seen at one of four Cancer Treatment Centers of America (CTCA) hospitals (CTCA hospitals were CTCA Eastern, CTCA Midwestern, CTCA Southwestern and CTCA Western) between July 2011 and March 2013.	Patients satisfaction assessed by a paper-based questionnaire developed by the authors in 2006.	Patient survival between the dates a patient completed the survey and the date of patient's death from any cause or the date of last contact or last known to be alive.	On multivariate analysis, those who had better self-rated health had lower risk of mortality (hazard ratio = 0.25; 95 % CI: 0.11-0.58; p = 0.001) compared to those who had lower self-rated health. In addition, patient satisfaction was significant in the same analysis model (hazard ratio = 0.76; 95 % CI: 0.40-1.5; p = 0.40). Thus, self-rated health replaced patient satisfaction as a predictor for survival.

Table 2. Summary of the included studies (cont'd.)

Gupta, et al (2013). Patient satisfaction with service quality in an oncology setting: implications for prognosis in non-small cell lung cancer. International journal for quality in health care, 25(6), 696-703.	Prospective cohort study, 986 patients, USA.	Cancer Treatment Centers of America®(CTCA) hospitals, USA.	To evaluate the relationship between self-reported satisfaction with service quality and overall survival in non-small cell lung cancer.	Non-small cell lung cancer	Adult non-small cell lung cancer patients who were seen at one of three Cancer Treatment Centers of America (CTCA) hospitals (CTCA Eastern, CTCA Midwestern and CTCA Southwestern) between July 20017 and December 2010.	Patients satisfaction assessed by a paper-based questionnaire developed by the authors in 2006.	Patient survival between the dates a patient completed the survey and the date of patient's death from any cause or the date of last contact or last known to be alive.	Patients who had higher satisfaction with their service quality with their service quality had lower mortality (hazard ratio = 0.71; 95% CI: 0.60–0.85; $P < 0.001$) than those who had lower satisfaction score after controlling for stage at diagnosis, treatment history, gender, and age.

Appendix 1. Quality assessment for the included quantitative studies

Citation	Selection bias	Study design	Confounder	blinding	Data collection methods	Drop outs	Analysis	Overall rating
Buis, et al (2011)	N/A*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose, J. H., et al (2004)	strong	moderate	strong	strong	strong	moderate	strong	strong
Gleason, et al (2009)	moderate	weak	weak	strong	moderate	N/A	strong	moderate
Burns, C. M., et al (2005)	moderate	moderate	strong	N/A	strong	strong	strong	strong
Cunningham al (2000)	weak	moderate	moderate	strong	strong	weak	strong	moderate
Daly, et al (2013)	moderate	strong	strong	strong	strong	strong	strong	strong
Guo, Z., et al (2013)	strong	strong	strong	strong	strong	strong	strong	strong
McCarthy, et al (2007)	moderate	weak	moderate	N/A	strong	N/A	moderate	moderate
Lis, et al (2015)	moderate	weak	weak	moderate	moderate	weak	moderate	weak
Gupta, et al (2012)	moderate	weak	weak	moderate	moderate	weak	moderate	weak
Gupta, et al (2014)	moderate	weak	weak	moderate	moderate	weak	moderate	weak
Lis, et al (2006)	weak	moderate	weak	moderate	moderate	weak	moderate	moderate
Lis, et al (2006)	weak	moderate	moderate	moderate	moderate	weak	moderate	moderate
Gupta, et al (2013)	weak	moderate	weak	moderate	moderate	weak	moderate	moderate
Gupta, et al (2015)	moderate	weak	weak	moderate	moderate	weak	moderate	weak
Gupta, et al (2013)	moderate	weak	moderate	moderate	moderate	weak	moderate	moderate